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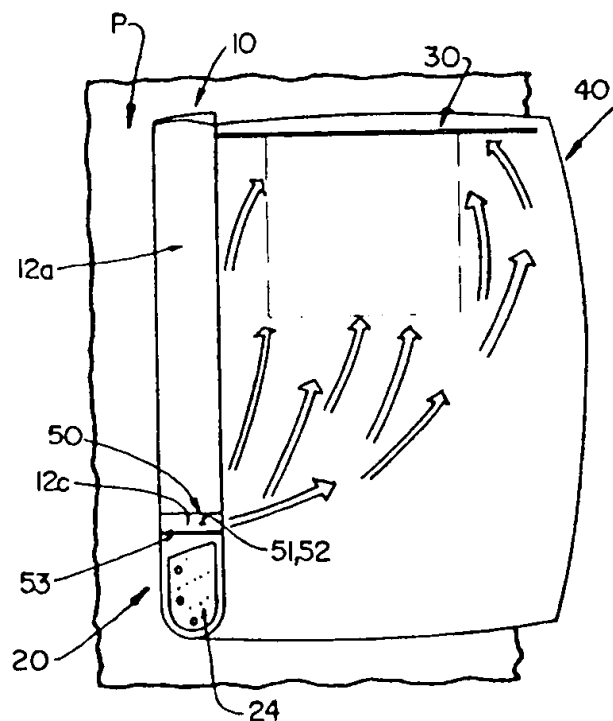
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/BR94/00001 <b>(22) International Filing Date:</b> 31 January 1994 (31.01.94) <b>(30) Priority Data:</b> PI 9300343 9 February 1993 (09.02.93) BR <b>(71) Applicant (for all designated States except US):</b> SEMER S/A [BR/BR]; Rua Olympia Semeraro, 675, 04183-901-São Bernardo do Campo, SP (BR). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> DALLA VALLE, Florisvaldo [BR/BR]; Rua Araripe, 179, 03215-010-São Paulo, SP (BR). <b>(74) Agents:</b> ARNAUD, António, M., P. et al.; Rua José Bonifácio, 93, 8th floor, 01003-901-São Paulo, SP (BR).		<b>(81) Designated States:</b> US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

**(54) Title:** MULTIFUNCTION DRIER**(57) Abstract**

Multifunction drier, of the type comprising: a heating head (20); a suspension clothesline (30), which is movable between a retracted inoperative position and a horizontal extended operative position; and a dismountable drying chamber (40), which surrounds at least the suspension clothesline (30) in its operative position, said heating head (20) being disposed so as to present air inlet openings (22a), external to the drying chamber (40), and air outlet openings (22b), which open directly to the lower portion of said drying chamber (40), as well as to direct at least a flow of hot air upwardly within said drying chamber (40), when said heating head (20) is at a first operative drying mode.



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MULTIFUNCTION DRIERField of the Invention

The present invention refers to a multifunction drier  
5 for domestic use, which is particularly useful for  
drying clothes and which is attached to a supporting  
structure, such as a wall.

Background of the Invention

The known domestic driers comprise a heating head,  
10 which usually incorporates in a single piece a  
suspension clothesline and a drying chamber.

In these constructions, the fixation of the drier to a  
wall is made by articulating the back upper edge of the  
heating head to said wall, in order to allow the  
15 heating head and eventually the other components, when  
assembled in a single piece, to be angularly and  
vertically displaced between inoperative and operative  
positions, that are offset from each other in  $90^{\circ}$  and  
that are respectively defined when said heating head is  
20 parallel and orthogonal in relation to the supporting  
structure.

Said operative position is usually obtained through an  
upward angular displacement of said heating head, from  
the inoperative position towards its horizontalization,  
25 when locking means retain said heating head at the  
operative position.

The space taken up by said driers when at the operative  
position is defined by the dimensions of the heating  
head, whose peripheral contour is at least equal to the  
30 cross section of the drying chamber.

The drying operation is achieved through a flow of hot  
air conducted downwardly, directly from the heating  
modulus towards the inside of the drying chamber. In  
some models, this flow of hot air is directed to a  
35 lower portion of said drying chamber by an air  
directing duct, which is internally provided through

the back and lower walls of said chamber.

One of the problems of said driers refers to the drying operation. In all these constructions, only hot air is used for the drying, said hot air being directed to the articles by a descending flow of air, i.e., the drying is obtained through a flow of air of the same direction as the amount of humidity to be removed from the clothes. Said direction results in an irregular drying, which is prejudicial to the clothes, since it causes the overdrying of the fibers at the portions of said clothes situated close to the hot air exit and naturally provided with less humidity. This occurs due to the excessive time to which said portions are exposed to said hot air in relation to the time they need to become dried. Nevertheless, said time is the minimum time to obtain the drying of the lower part of said articles, which are usually wetter.

Although the solution of providing a hot air directing duct at the lower portion of the drying chamber has minimized the problem of irregular drying, said solution presents the following inconveniences: high energetic consumption, since it requires more motor power, so that the flow of hot air can reach the lower portion of the drying chamber with the necessary intensity to execute the drying of the clothes at said lower portion, at a determined time interval; and short service life of said directing duct, due to the passage of the hot air that dries the fibers of said duct, which thus becomes fragile and susceptible to cracks and breaks.

Moreover, the fixation of the drying chamber to the heating modulus makes difficult the internal cleaning of said drying chamber, as well as the bending thereof, after the drier has been deactivated and returned to its inoperative condition, when said drier is positioned adjacent to the supporting wall.

Furthermore, in said solutions, the heating modulus can not be easily removed, without dismounting the whole drier.

Although presenting the same inconveniences related to drying cited above, another known solution presents the heating modulus, which can be removed from its fixing support at the supporting wall, without taking together adjacent parts of the drier, such as the suspension clothesline and drying chamber, thereby allowing its optional use both as a heater and an air circulating device in other places. All the different functions, i.e., drying, heating and air circulation are achieved through the manual operation of the function selectors.

Nevertheless, an inconvenient of said removable modulus refers to its large dimensions, since said modulus, like the ones mentioned before, also presents a peripheral contour at least matching with the cross section of the drying chamber.

20. Disclosure of the Invention

Thus, it is an object of the present invention to provide a clothes drier, which can dry the clothes disposed therewithin, without causing wear in the fibers that form said drier by the loss of the natural humidity of said fibers, and without requiring the provision of directing ducts that increase the energetic consumption.

Another object of the present invention is to provide a drier as described above, in which the heating modulus is not dimensionally associated with the width and depth of the drying chamber, and which is at least partially and easily removable for a diversified use in another place.

These and other objects of the present invention are achieved through a multifunction drier, comprising a heating head; a suspension clothesline, which is

movable between a retracted inoperative position and an extended horizontal operative position; and a drying chamber, which is dismountable and which surrounds at least the suspension clothesline at the operative position thereof, said heating head being disposed so as to present air input openings, external to the drying chamber and air output openings, leading directly to the lower portion of said drying chamber, and to direct at least a flow of hot air upwardly within said drying chamber, when the heating head is at a first drying operative mode.

#### Brief Description of the Drawings

The invention will be described below, with reference to the attached drawings, in which:

- Fig. 1 illustrates, schematically, a lateral view of a prior art drier, in an operative position;
- Fig. 2 illustrates, schematically, a front view of a drier, according to the present invention, at an operative position;
- Fig. 3 illustrates, schematically, a front view of the drier of figure 2, in an inoperative position;
- Fig. 4 illustrates a front view of the drier of figure 3, with the cabinet being partially cut for a better visualization of the clothesline of the drying chamber in the inoperative condition;
- Fig. 5 is a detailed perspective view of the fitting of the suspension clothesline into the cabinet, according to the present invention;
- Fig. 6 illustrates, schematically, a perspective view of the fitting of the bars of the suspension clothesline into a basic structure of said bars; and
- Fig. 7 illustrates, schematically, a perspective view of the heating head of the drier of the present invention, detached from the other components of said drier.

#### Best Mode of Carrying Out the Invention

According to the above described figures, the drier of the present invention comprises a heating head 20, a suspension clothesline 30 and a drying chamber 40, which are removably mounted to a supporting means, articulated to a wall or supporting structure P, preferably in the form of a panel or, more preferably, in the form of a supporting cabinet 10.

In this construction, the supporting cabinet 10 is attached to the supporting structure P, in order to present an angular displacement between an inoperative position, adjacent and parallel to the supporting wall P, and an operative position, vertically orthogonal to said supporting wall P. Said displacement is obtained by 90° rotations of said supporting cabinet 10, to and from the inoperative position, made around a vertical axis that matches with a vertical back edge of said supporting cabinet 10. Said cabinet presents a construction that permits the mounting of the suspension clothesline at its operative horizontal position, thereby guaranteeing a minimum gap relative the supporting wall P, in order to allow the mounting of the drying chamber 40 to the assembly.

Said supporting cabinet 10 presents a front panel 11, from whose edges there are extended, orthogonally to and in the direction of the supporting wall P, a pair of lateral walls 12a, an upper wall 12b and a lower wall 12c, said walls defining, together with the front panel 11, a kind of tray that faces the supporting wall P and that receives the suspension clothesline 30 and the drying chamber 40, at the inoperative position.

The retraction of the suspension clothesline 30 occurs by tilting the latter around a rotating axis, which is orthogonal to the articulating edge of the supporting cabinet 10. This movement will be described hereinafter.

Said supporting cabinet 10 can further present

internally, a reinforcing rod 15, which is diagonally disposed, so as to have its lower end adjacent to the supporting wall P, when the cabinet is at the operative position, thereby avoiding deformations of said cabinet  
5 10, resulting from the concentration of forces existing at the free end of the suspension clothesline 30, said end being spaced away from said supporting wall P.

In the described constructive form, the opposite end lateral edges of the lower wall 12c of the supporting  
10 cabinet 10 are provided with fitting and locking means 50, which act between said supporting cabinet 10 and the heating head 20, when the latter is mounted at said supporting cabinet 10. According to the illustrated figures, said fitting and locking means 50 are in the  
15 form of a pair of male-female fittings 51, 52 and a locking pin 53. The male-female fittings comprise a pair of engaging pins 51, each being preferably provided at an end lateral edge of the heating head 20, and a pair of retaining openings 52, each provided at  
20 each lower end lateral edge of the supporting cabinet 10, so as to receive a corresponding engaging pin 51.

In the described embodiment, the locking pin 53 is disposed at one of the end lateral edges of the supporting cabinet 10, in order to be manually moved  
25 between a heating head releasing position and a heating head retaining position, said positions being obtained by vertical displacements of said locking pin 53 and defined by a retraction and an advance of a lower end of the locking pin 53, relative the end edge of the  
30 supporting cabinet 10, at which end the locking pin 53 is mounted.

In this construction, the mounting of the heating head 20 to the supporting cabinet 10 begins by fitting the pair of male-female fittings of the end lateral edge of  
35 said cabinet 10, said edge being opposite to that one whereto the locking pin 53 is mounted. After the



fitting of the two pairs of male-female fittings, said locking pin 53 is taken to its retaining position, which avoids the relative movements between the heating head 20 and the supporting cabinet 10.

- 5 Although a preferred form of locking between the heating head and the cabinet has been described, it should be understood that other embodiments for said locking are possible, such as the solutions presenting fitting rails between the heating head 20 and the supporting cabinet 10, or fitting pins, which may be manually or automatically retracted, etc..

The locking between the heating head 20 and the supporting cabinet 10 is detected by a sensor, which is not illustrated and which is disposed at a portion of the lower wall 12c of the supporting cabinet 10, said sensor instructing the heating head 20 to operate as a drier, as it will be described below, as soon as it detects the locking thereof to the supporting cabinet 10.

- 20 The heating head 20 presents a basic body 21, of an elongated parallelepipedic form, with a free lateral lower face 21a, preferably rounded, and an opposite contact lateral upper face 21b, having a peripheral contour similar to the profile of the lower wall 12c of the supporting cabinet 10. At the preferred constructive form, the lower face 21a and upper face 21b are respectively provided with a plurality of air input openings 22a and a plurality of air output openings 22b. Said basic body 21 further presents end walls 23, one of which being provided with a drying operation control panel 24, onto which is disposed an actuating button which, upon being pressed, energizes an electric motor, non-illustrated, to actuate the heating head 20, according to the desired function.

- 35 When said heating head 20 is mounted at the supporting cabinet 10, the pressing of the actuating button

actuates said heating head 20, which has already been instructed by the sensor to operate as a drier, thereby initiating the drying operation. In this process, the control panel 24 allows the adjustment of the drying  
5 time as determined by the user, said time being visually indicated by leds disposed on said panel.

When removed from the supporting cabinet 10, the heating head 20 may operate selectively, either as a heater or as an air circulating device. For these  
10 modes of operation, the user may direct angularly the air flow, which is emerging from said heating head 20, according to an inclination angle defined by said user. This angular position is obtained by manually pressing a button 25, which is provided at a portion of the  
15 upper face 21b of the basic body 21 and which commands the forward and backward movements of a positioning rod 26, relatively said basic body 21 to which it is mounted.

The pressing of said button 25 unlocks the positioning  
20 rod 26 from its anterior position, thereby allowing the repositioning thereof. The releasing of said button 25 locks the positioning rod 26 at its new position, till said button 25 is pressed again. The maximum angle of inclination of the heating head 20 is defined by the  
25 extension of said positioning rod 26.

Although there has been illustrated a heating head 20, which may be completely removed from the supporting cabinet 10, other solutions are possible, such as those where only part of said head 20 is removed, in order to  
30 actuate as a heater.

In any of the situations described above, there is provided a portable heating head of small dimensions and easy handling.

The supporting cabinet 10 is upperly provided, from the  
35 internal face of each of the lateral walls 12a, with a suspension clothesline fitting portion 17, in which

there are defined first and second fittings 17a, 17b, for receiving corresponding articulating pins 31 and locking pins 32 of the suspension clothesline 30. Each first fitting 17a is in the form of an oblong hole, in which a corresponding clothesline articulating pin 31 is fitted. The displacement of said suspension clothesline 30 between the inoperative and operative positions takes place around an axis, whose rotation matches with the alignment of said articulating pins 31 into the oblong hole 17a.

When at the inoperative position, each said articulating pin 31 is positioned at a first end portion of the oblong hole 17a, said portion acting as a rotational center for the suspension clothesline 30, between its inoperative and operative positions. While each articulating pin 31 is at said first end portion, the locking pin 32 can move freely in the second fitting 17b, which is in the form of a bent slot, with its lower and upper ends being offset from each other in  $90^{\circ}$ , the positioning of each articulating pin 32 at said lower and upper ends of the respective bent slot 17b corresponding to the inoperative and operative positions of the suspension clothesline 30.

The displacement of said suspension clothesline 30 towards the operative position occurs through the upward sliding movement of each locking pin 32 along the corresponding bent slot 17b, while each respective articulating pin 31 is at the first end portion of the corresponding oblong hole 17a. The locking of the suspension clothesline 30 at the operative position occurs through the retraction of the pair of locking pins 32 towards a locking portion 17c of the bent slot 17b, said portion 17c being defined at the upper and lower ends of each bent slot 17b. Said locking portion 17c of the bent slot 17b is defined in this construction as an extension of said bent slot 17b,

said extension being radially spaced back relative said slot. So, the respective articulating pins 31 are displaced to a second end portion of the respective oblong hole 17a, there remaining till the suspension clothesline 30 is removed from its operative position. The displacement of said suspension clothesline 30 to and from its operative position is manually achieved. The mounting of the suspension clothesline 30 to an operative position is achieved by the rotation thereof in about  $90^{\circ}$ , preferably  $95^{\circ}$ , around a horizontal axis, which is orthogonal to the rotational axis of the supporting cabinet 10.

According to the illustrated figures, the suspension clothesline 30 is presented as a rectangular basic structure, provided with a plurality of internal longitudinal bars 33, for supporting the pieces of clothes to be dried. Said internal longitudinal bars 33 have their ends fitted, respectively, into an internal crossbeam 34a and an external crossbeam 34b of the basic structure. This fitting allows the user to remove said internal bar 33, or a better distribution thereof inside the basic structure of the suspension clothesline 30, according, for example, to the dimensions of the articles to be deposited thereon, in order to be dried.

Said internal crossbeam 34a and external crossbeam 34b interconnect two fixed lateral longitudinal bars 33a, 33b, which, together with the internal crossbeam 34a and external crossbeam 34b, define the rectangular profile of the suspension clothesline 30. The end of each said lateral longitudinal bars 33a, 33b adjacent to the supporting cabinet 10 is in the form of a hook portion, whose end, facing outwardly the rectangular structure, defines a corresponding locking pin 32, as described above.

Similarly, the articulating pins 31 are defined by a

projection of the opposite ends of the internal crossbeam 34a, beyond the lateral longitudinal bars 33a, 33b.

When at the operative position, the suspension  
5 clothesline 30 and at least a portion of the supporting cabinet 10, in which circulates the air for drying the clothes, are surrounded by a preferably translucent tubular casing, which defines the drying chamber 40. Said tubular casing presents an open nozzle, whereby  
10 the drying chamber is introduced into the supporting cabinet/suspension clothesline assembly, so as to involve the articles to be dried. In order to complete the mounting, said tubular casing has its edges attached to the structure of the supporting cabinet 10,  
15 by any adequate means, which seals the inside of the drying chamber, thereby allowing no contact with the external environment, in order to avoid loss of drying air flow from the inside of said drying chamber 40. The construction of said casing provides, nevertheless,  
20 at least an upper vapor exit, in order to avoid the condensation of the hot air along the internal walls of the drying chamber.

The drying operation takes place after the clothesline 30 and the drying chamber 40 have been mounted, as  
25 described below.

With the heating head 20 installed at the supporting cabinet 10, the sensor instructs said heating head 20 to operate as a drying modulus of a clothes drier. The actuation of said heating head 20 causes the  
30 suction of the environmental air, through the air inlets 22a, towards the inside of the drying chamber 40. During this suction, said air is heated and released to said drying chamber 40, through the upper air outlets 22b, which are disposed at the internal  
35 lower end portion of the supporting cabinet 10, said portion being adjacent to the portion of the articles

to be dried, where there is naturally a larger amount of humidity.

This heated air circulates through the articles during its normal upward movement, thus making the humidity thereof evaporate and conducting the vapor outwardly the drying chamber 40, through the upper opening of the tubular casing. The circulation of the air heated by the drying chamber 40 removes the humidity from the clothes and from the internal environment of said chamber. In order to avoid the overdrying of the fibers of the clothes, as well as of the drying chamber itself, the drier of the present invention is pre-programmed, at a final operative period of time, regardless of the duration of time for the drying determined by the operator, to allow the heating head 20 release into the drying chamber 40 a flow of cold air, sufficient to adjust the natural humidity of the fibers of the dried clothes that are suspended on the suspension clothesline 30 and of the walls of the drying chamber 40, thereby avoiding the overdrying of said elements.

CLAIMS

1. Multifunction drier, of the type comprising: a heating head (20); a suspension clothesline (30), which  
5 is movable between a retracted inoperative position and a horizontal extended operative position; and a dismountable drying chamber (40), which surrounds at least the suspension clothesline (30) in its operative position, characterized in that the heating head (20)  
10 is disposed so as to present air inlet openings (22a), external to the drying chamber (40), and air outlet openings (22b), which open directly to the lower portion of said drying chamber (40), said heating head directing at least a flow of hot air upwardly within  
15 said drying chamber (40), when said heating head (20) is at a first operative drying mode.
2. Multifunction drier, according to claim 1, characterized in that the supporting means comprises a supporting cabinet (10), which is movable from a  
20 retracted inoperative position relative the supporting structure (P), and an operative position, projecting from said supporting structure (P), said cabinet defining at least the lateral wall of the drying chamber (40) when at the operative position.
- 25 3. Multifunction drier, according to claim 2, characterized in that the supporting cabinet (10) is in the form of a tray, which is opened to the supporting structure (P) and which surrounds, at the inoperative position, at least the suspension  
30 clothesline (30) and the drying chamber (40).
4. Multifunction drier, according to claim 3, characterized in that the supporting cabinet (10) carries, inferiorly, the heating head (20), so that the latter can operate at the first drying operative mode.
- 35 5. Multifunction drier, according to claim 4, characterized in that the supporting cabinet (10) is

articulated to the supporting structure (P) by a back upper edge, so as to define the inoperative and operative positions of said supporting cabinet (10), when the latter remains parallel and orthogonal relative the supporting structure (P), respectively.

6. Multifunction drier, according to claim 2, characterized in that the suspension clothesline (30) is mounted inside the supporting cabinet (10).

7. Multifunction drier, according to claim 3, characterized in that the suspension clothesline (30) is articulated to an internal upper portion of the tray, so as to have the operative and inoperative positions thereof defined by the tilting of said suspension clothesline (30) around an articulating axis, orthogonal to the articulating axis of the supporting cabinet (10).

8. Multifunction drier, according to claim 7, characterized in that the suspension clothesline (30) presents, internally the basic structure thereof, a plurality of removable internal rods.

9. Multifunction drier, according to claim 7, characterized in that the suspension clothesline (30) presents, internally the basic structure thereof and defined by a pair of lateral longitudinal bars (33a, 33b) interconnected by a pair of end crossbeams (34a, 34b), a plurality of internal longitudinal bars (33), which slide along said basic structure, between said lateral longitudinal bars (33a, 33b).

10. Multifunction drier, according to claim 2, characterized in that, in the operative position of the supporting cabinet (10), the drying chamber (40) is mounted to said supporting cabinet (10), in order to surround at least the air outlet (22b) of the heating head (20) and the suspension clothesline (30).

11. Multifunction drier, according to claim 2, characterized in that the heating head (20) is



attached to the supporting cabinet (10), thorough locking means (51, 52, 53), disposed between said heating head (20) and the supporting cabinet (10).

12. Multifunction drier, according to claim 11,  
5 characterized in that one of the portions defined by the heating head (20) and the lower portion (12c) of the supporting cabinet (10) carries a sensor, which detects the mounting of said heating head (20) to the supporting cabinet (10), instructing said heating head  
10 (20) to operate according to the first operative mode.

13. Multifunction drier, according to claim 12, characterized in that, at the first operative mode, the heating head (20) directs a flow of cold air towards the inside of the drying chamber (40), after a  
15 determined time interval has elapsed in the operation with the flow of hot air.

14. Multifunction drier, according to claim 13, characterized in that a second and a third operative modes are obtained when the heating head (20) is  
20 removed from the supporting cabinet (10).

15. Multifunction drier, according to claim 14, characterized in that the second and the third operative modes of the heating head (20) result in heating or refrigerating operations of the  
25 environmental air.

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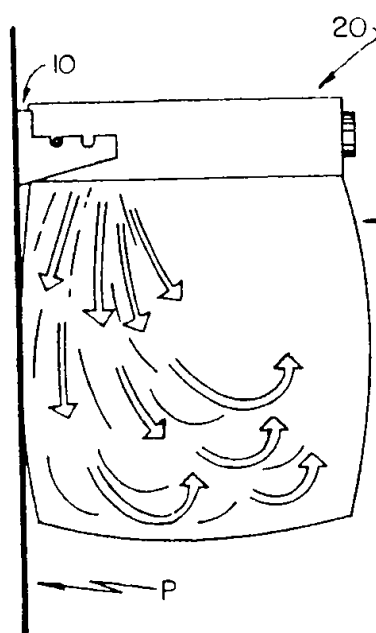


FIG. 1

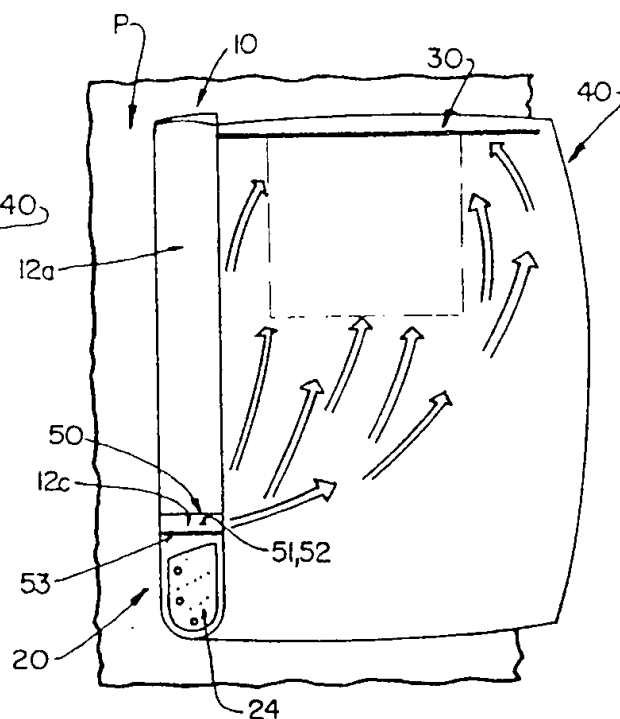


FIG. 2

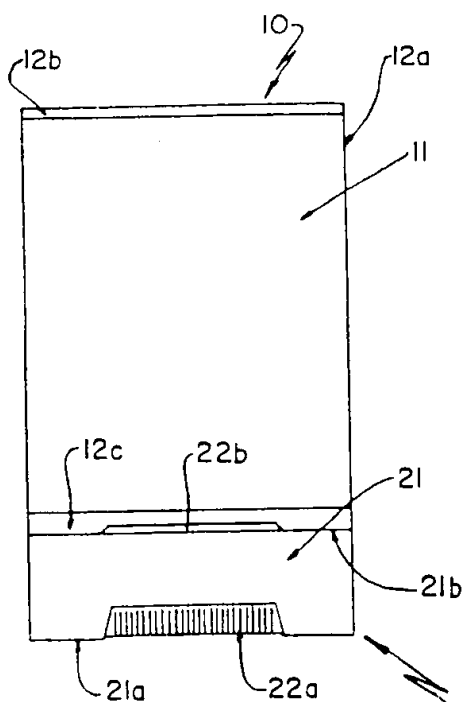


FIG. 3

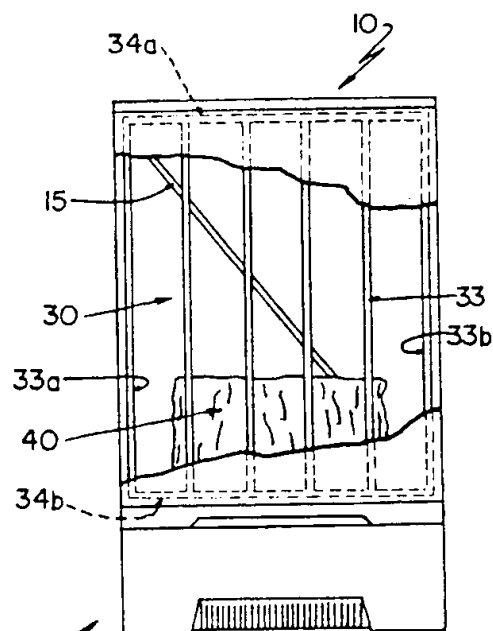


FIG. 4

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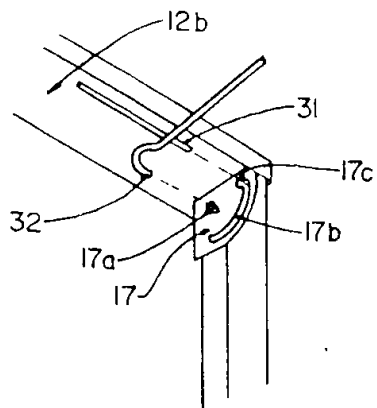


FIG. 5

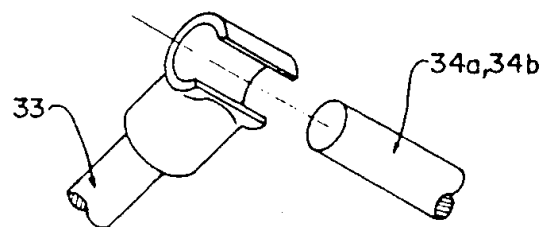


FIG. 6

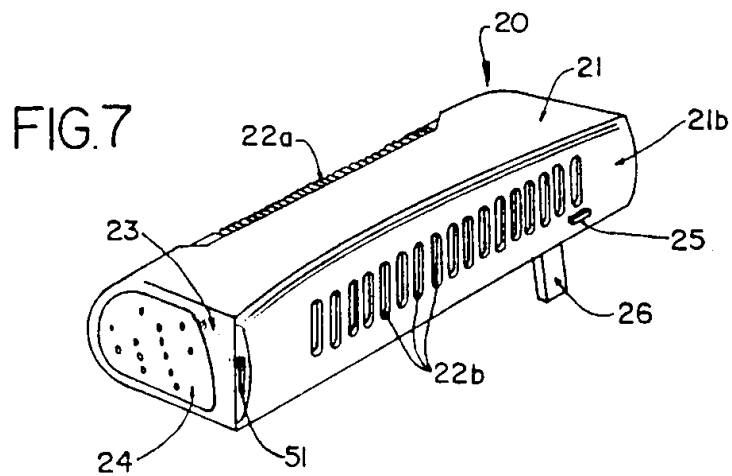


FIG. 7

## INTERNATIONAL SEARCH REPORT

In. tional Application No

CT/BR 94/00001

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 5 D06F58/14

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 5 D06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,2 919 497 (F. GOLDBERGER KONSTANT) 5 January 1960	1
A	see the whole document	2-10,13, 15
	---	
X	FR,A,2 054 819 (EGISA-RAND S.R.L.) 7 May 1971	1
A	see claims; figures	2-4,6-8, 10,13,15
	---	
X	FR,A,2 060 257 (H.J. DUPLESSY) 18 June 1971	1
A	see claims; figures	2-4, 6-10,13, 15
	-----	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

27 June 1994

Date of mailing of the international search report

18.07.94

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.

PCT/BR 94/00001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-2919497		NONE	
FR-A-2054819	07-05-71	NONE	
FR-A-2060257	18-06-71	NONE	